

## **Modelling sectoral energy consumption in Malaysia: assessing the asymmetric effects**

### **ABSTRACT**

Economic growth, energy prices, technological innovations, and financial depth all play a vital role in sectoral energy consumption. Early studies have extensively examined the interactions among these variables, which are important in developing policies on energy consumption. However, to date, most studies have estimated energy consumption in a linear fashion. If the actual relationship is non-linear or asymmetric, then the inferences drawn from a linear framework may be misleading. Hence, in this study, we employed a non-linear autoregressive distributed lag (NARDL) approach to analyse Malaysian sectoral energy consumption from 1978 to 2016. We found that the bounds test of the NARDL indicates the presence of cointegration among the variables. The key findings include: (1) a rise in income increases energy consumption throughout all sectors, but sectoral energy consumption does not respond significantly to a fall in income; (2) both increases and decreases in energy prices reduce industrial energy consumption, but residential and commercial sectors' energy consumption react positively to price falls; (3) technological advancement increases transportation energy consumption; and (4) both an increase and decrease of credit availability to private sectors reduce industrial energy consumption, but transportation energy consumption reacts positively to financial deepening. Moreover, the effects at the sectoral level were asymmetrical. The findings indicate that the changes in selected macroeconomic variables were found to have a Granger causality effect on sectoral energy consumption. Given these findings, our study offers empirical support for the inclusion of non-linearity or asymmetric effects when modelling sectoral energy consumption.